Design And Construction Guidelines For Dams

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PDH: 10

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Module 1. Introduction to the Guidelines

Learning Objectives

By the end of this section, you will be able to:

- **Identify** the specific criteria that place a dam under the jurisdiction of the TCEQ Dam Safety Program.
- **Evaluate** the regulatory and professional requirements for submittal packages regarding dam construction and modification in Texas.
- **Apply** appropriate engineering standards when preparing plans, specifications, and reports for jurisdictional dams.

Executive Summary: This chapter establishes the regulatory framework and professional expectations for dam engineering in Texas. All jurisdictional dam projects—defined by specific height, storage, and hazard criteria—must adhere to the Texas Administrative Code and the Texas Engineering Practice Act, requiring oversight by a Licensed Professional Engineer and formal approval from the TCEQ.

Design Fundamentals

This module outlines the mandatory design and construction requirements for both **proposed dams** and the **modification of existing structures** (including reconstruction, enlargement, rehabilitation, or repair) within the state of Texas.

To ensure an adequate review by the TCEQ, a complete submittal package must include:

- **Engineering plans and specifications**
- **Inspection records**
- **Technical reports**
- **Operational records**

While these guidelines provide explicit standards, the TCEQ allows for **alternate designs** or **unconventional practices**, provided the engineer can demonstrate they are both safe and effective.

⚠️ **Safety Constraint**: Always specify the version of the guidelines used in your submittal. These documents are subject to periodic revision to reflect updated safety standards and public comment.

Regulatory Authority

These requirements serve as a formal supplement to the **Texas Administrative Code (TAC)**, specifically Title 30, Part 1, Chapter 299, "Dams and Reservoirs."

Professional Responsibility and Duty

The design and quality assurance of dam construction in Texas are strictly classified as the practice of engineering.

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- **Licensing**: All work must be performed by a **Licensed Professional Engineer (PE)** or under their direct guidance.
- **Compliance**: All activities are subject to the **Texas Engineering Practice Act**.
- **Competency**: Practitioners are expected to be proficient in standard engineering software for **stability analyses** and **erosion stability** assessments.

💡 **Design Tip**: Peer-to-peer accountability is central to the TCEQ program. Ensure all stability models are documented with clear assumptions to facilitate the regulatory review process.

Applicability

These guidelines apply to all dams under the jurisdiction of the **TCEQ Dam Safety Program**. Note that certain projects may have overlapping jurisdiction and must also satisfy the requirements of:

- **U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS)**
- **U.S. Army Corps of Engineers (USACE)**

Jurisdictional Criteria

According to 30 TAC 299.1(a), a dam falls under TCEQ jurisdiction if it meets **one or more** of the following criteria:

Criterion	Height Requirement	Storage Capacity Requirement
1	Greater than or equal to 25 feet	Greater than or equal to 15 acre-feet
2	Greater than 6 feet	Greater than or equal to 50 acre-feet
3	Any Height	Classified as High- or Significant-Hazard
4	Any Height	Used as a pumped storage or terminal storage facility

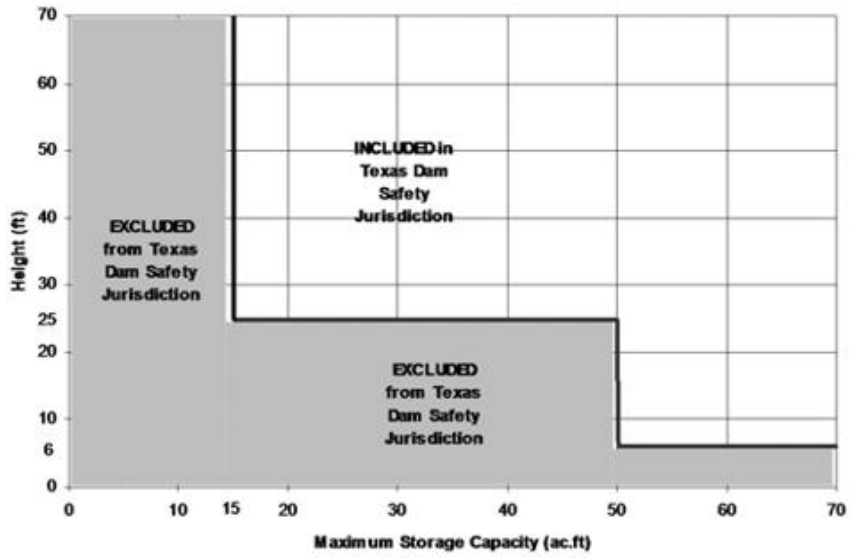

Figure 1.1. Definition of a Jurisdictional Dam

Calculation Note: When determining jurisdiction, "maximum storage capacity" refers to the volume of the impoundment at the top of the dam embankment, not just the normal pool level.

Acknowledgements

These guidelines incorporate established practices from various national agencies, including the bibliography of sources found at the conclusion of this course.

Checkpoint Quiz

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1. **A proposed dam is 20 feet high with a maximum storage capacity of 40 acre-feet. It is classified as a "Low-Hazard" dam. Does this fall under TCEQ jurisdiction?**
   a) Yes, because it exceeds 6 feet in height.
   b) Yes, because the combination of height and storage meets Criterion 2.
   c) No, because it does not meet the height/storage thresholds for Criteria 1 or 2 and is not High/Significant hazard.
   d) Yes, all dams in Texas are jurisdictional.

Answer: (c). The dam is under 25ft (Criteria 1) and does not reach the 50 acre-feet threshold required for dams over 6ft (Criteria 2).

2. **Which of the following is true regarding "unconventional practices" in dam design according to the guidelines?**
   a) They are strictly prohibited to ensure public safety.
   b) They are allowed only if the dam is less than 25 feet tall.
   c) They may be utilized if the engineer adequately demonstrates they are safe and effective.
   d) They do not require TCEQ review if signed by a PE.

Answer: (c). The guidelines allow for flexibility provided the engineer provides proof of safety and effectiveness.

3. **Under the Texas Engineering Practice Act, who is responsible for the quality assurance of a dam construction project?**
   a) The construction contractor exclusively.
   b) The local municipality.
   c) The Licensed Professional Engineer of record.
   d) The TCEQ field inspector only.

Answer: (c). Dam design and QA are considered the practice of engineering, placing responsibility on the licensed PE.

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Module 2. Submitting Construction Plans and Specifications

Learning Objectives

By the end of this section, you will be able to:

- **Identify** the minimum technical documentation and supplemental reports required for a complete TCEQ dam project submittal.
- **Evaluate** the specific content and formatting standards for construction plans, including mandatory map and profile details.
- **Apply** the regulatory timelines and notification requirements for the TCEQ review and approval process to project schedules.

Executive Summary: All engineering activities related to jurisdictional dams in Texas—including new construction, major modifications, and repairs—must be directed by a Texas-licensed Professional Engineer. A complete submittal package, containing sealed plans, specifications, and relevant supplemental reports (Geotechnical, H&H, etc.), must be approved by the TCEQ Dam Safety Program before construction begins.

Design Fundamentals

All engineering documents, including plans, specifications, and reports, must be prepared by or under the direct supervision of a **Professional Engineer (PE)** licensed in Texas. The PE must have direct responsibility for the analysis of the dam.

Submittals must sufficiently document the **technical basis** for the design, including:

- Methods used for analysis.
- Key assumptions.
- Results and conclusions of all investigations and diagnostic work.

💡 **Design Tip**: If you are proposing the **major rehabilitation of a large dam**, it is highly recommended to meet with the TCEQ Dam Safety Program before developing final construction plans to ensure alignment on technical expectations.

Minimum Requirements for Submission

The core of the submittal is the final set of **signed and sealed construction plans and specifications**. Supplemental information is required based on the project type.

New Dam or Major Modification Project

A **major modification** is defined as any change that alters the hydraulic or structural design or capabilities of the dam. Requirements include:

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- **Form TCEQ-20345**: Information Sheet
- **Form TCEQ-20346**: Hydrologic and Hydraulic (H&H) Evaluation Summary
- **Design Report**: Assessing size, hazard classification, and FEMA floodplain requirements.
- **Geotechnical Report**: Including stability analyses.
- **H&H Analyses**: To verify spillway and storage capacity.
- **Breach Analyses**: Required if the dam cannot handle its required design flood (includes inundation mapping).
- **Quality Control Plan**, **Closure Plan**, and **Emergency Action Plan**.
- **Instrumentation and Monitoring Plan** (if applicable).

⚠️ **Safety Constraint**: For large, high-hazard dams with complex technical issues, the TCEQ may require the owner to retain an **independent team of expert engineers** to assist in the evaluation and design process.

Major Repair Project

A **major repair** does NOT change the hydraulic or structural design but exceeds normal maintenance. Requirements include:

- Information Sheet (TCEQ-20345), Design Report, Geotechnical Report, Quality Control Plan, and Emergency Action Plan.

Removal or Permanent Breach Project

- **Design Report**: Must address all criteria in the *TCEQ Dam Removal Guidelines*.
- **Hydraulic Analysis**: For permanent breaches, must demonstrate the breach can handle the peak inflow from the design flood without overtopping the remaining structure.

Emergency Repair Project

Emergency repairs do **not** require prior approval under 30 TAC 299.45.

- **Immediate Action**: Implement the emergency action plan under PE supervision.
- **Notification**: Notify the TCEQ Dam Safety Program via phone, email, or fax within **12 hours** of discovery.
- **Follow-up**: A PE must develop plans for permanent repairs for TCEQ review once the emergency is stabilized.

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